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ABSTRACT

This document presents the statement of work for electromagnetic compatibility (EMC) testing of the S-IC Stages (S-IC-3 through S-IC-10) manufactured by The Boeing Company and the associated test and checkout equipment at Michoud and the Mississippi Test Facility.

KEY WORDS

Electromagnetic
Interference
Radiation
Transient
Conducted



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1.0 INTRODUCTION

1.1 Purpose

The purpose of this document is to present the contractor's statement of work for electromagnetic compatibility acceptance testing of the S-IC Stages manufactured by the contractor and the test and checkout (T&CO) equipment at Michoud and the Mississippi Test Facility (MTF).

1.2 Scope

Section 3.0 presents a general description of the electromagnetic compatibility testing of the S-IC Stages and test and checkout equipment. Additional, and a more detailed description is presented in Section 4.0.

2.0 APPLICABLE DOCUMENTS

| <u>Reference Number</u> | <u>Date</u> | <u>Title</u> |
|-------------------------|-------------------|------------------------------|
| 40M30596 | February 17, 1964 | S-IC/S-II Interface Document |



3.0 ELECTROMAGNETIC COMPATIBILITY TESTING - GENERAL DESCRIPTION

MSFC will conduct electromagnetic qualification type tests on the S-IC-1 and S-IC-2 Stages in the R-QUAL laboratory. The results of these tests will be made available to the contractor; however, lack of these results will in no way delay the finalizing of electromagnetic compatibility (EMC) test preparations for the S-IC-3 Stage.

The contractor will accomplish EMC acceptance testing during the post manufacturing tests on the stages manufactured by the contractor (S-IC-3 through S-IC-10) and the test and checkout (T&CO) equipment at Michoud and MTF. These will be conducted largely in parallel with the presently planned post manufacturing acceptance tests. The extent of the EMC tests to be performed on stages subsequent to S-IC-3 and on T&CO equipment subsequent to the first set tested for EMC will be determined by the contractor based on the results of previously conducted tests.

3.1 Test Criteria

Electromagnetic compatibility testing will be in accordance with the following.

- a. The EMC testing will determine whether the margin of safety is at least 6 db at selected test points. The test points will be selected at intra-stage, intra-T&CO equipment, stage-to-stage interface and at stage-to-T&CO equipment interface locations. Testing will also include measurement of electromagnetic radiation from the stage and T&CO equipment.
- b. The test points will be selected from a list of critical stage and T&CO equipment. MSFC (R-QUAL-PIE and R-QUAL-PIR) will assist the contractor in the designation of this critical stage and T&CO equipment. Such designations are to be completed by October 1, 1965.

4.0 ELECTROMAGNETIC COMPATIBILITY TESTING - DETAIL DESCRIPTION

4.1 Testing Program - S-IC-3 through S-IC-10

EMC testing will be conducted as follows.

4.1.1. Conducted EMC Tests

Conducted EMC testing will consist of monitoring inputs to that stage and T&CO equipment identified in paragraph 3.1.a. This monitoring shall be capable of measuring that transient, broadband, or narrow-band interference to which the critical stage and/or T&CO equipment may be susceptible. EMC testing will be performed only once on the T&CO equipment in each test cell (beginning with S-IC-3) provided there are no significant electrical or configuration changes between stage checkouts. If there are significant



electrical or configuration changes, the changes will be retested for EMC. T&CO equipment tests will be performed prior to connection to the stage by using the S-IC Stage simulator.

4.1.2. Radiated EMC Tests

Radiated EMC testing will consist of monitoring the vehicle frequency bands defined by MSFC (R-QUAL-PIR). (This definition to be supplied to the contractor by October 1, 1965, and revised as S-IC-1 and S-IC-2 test results show the need.) The test area ambient electromagnetic environment in these frequency bands will be determined by the contractor just prior to radiated EMC tests.

4.1.3 Transient EMC Tests

The transient monitoring portion of the EMC tests will be performed as part of the conducted EMC test (paragraph 4.1.1). There will be no transient injection tests.

4.2 Supplemental Testing - S-IC-3 Stage Only

4.2.1 Critical Test Point Monitoring

At critical test points a 6 db signal will be injected over and above the measured ambient during the conducted test.

4.2.2 Range Safety System Monitoring

The range safety system will be monitored extensively during EMC radiated tests. The noise in the range safety system power busses shall be increased by 6 db during radiated tests. The above monitoring will be done to determine this critical system's performance in its environment.

4.2.3 Power Bus Transient Monitoring

Transients on all power busses will be monitored for peak and width, determining whether their time/amplitude conditions violate the preset criteria.

4.2.4 Ambient Noise Level Monitoring

The ambient noise level will be determined in the electrical cable tunnel. The tunnel ambient will then be subjected to a 6 db increase in signal to ensure a margin of safety of critical circuits.

4.3 Special Test Equipment

Special test equipment will be purchased and/or fabricated to accomplish the testing.

4.4 Data Submittal

The contractor will prepare and submit data as follows.



4.4.1 Documentation

The contractor will prepare and maintain EMC test criteria and EMC test requirements documents. MSFC (R-QUAL-PI) will provide specific and detailed inputs to these documents. MSFC approval of these documents is not required. The contractor will provide MSFC with up-to-date copies of these documents.

4.4.2 Test Procedures

Detailed test procedures will be submitted to the Contracting Officer for approval sixty days prior to commencement of testing.

4.5 S-II Stage Simulated Interface

The S-II simulated interface will be based upon the S-IC/S-II Interface Document, 40M30596, dated February 17, 1964.

4.6 EMC Corrective Action

Based on incompatibilities identified during the EMC test program, the contractor shall prepare and submit, for approval by separate contractual action, ECPs specifying the corrective action required to assure the EMC of the hardware.

